IB Math HL2 Name: ____

Integration Part 1 – Review

Indefinite Integration

1.) $\int (4x+7)^5 \cdot dx$

2.) $\int \frac{2}{\sqrt{1-4x}} \cdot dx$

3.) $\int \left(2e^{-3x} + \sqrt[3]{e^x}\right) \cdot dx$

4.) $\int 2^{3-6x} \cdot dx$

5.) $\int \frac{1}{3x-10} \cdot dx$

6.) $\int 4\cos^2 x - 2 \cdot dx$

Definite Integration - These are for practice only. Some of the answers do not exist in terms of area.

7.) $\int_{-1}^{0} (2r-1)^4 \cdot dr$

8.) $\int_{0}^{2} \frac{x+1}{x^2-1} \cdot dx$

9.) $\int_{0}^{1} \frac{1}{(2x+1)^3} \cdot dx$

10.) $\int_{-1}^{1} \frac{e^x+4}{e^x} \cdot dx$

11.) $\int_{0}^{2} 10^t \cdot dt$

12.) $\int_{0}^{\pi/2} \sin x \cdot dx$

13.) The derivative of the curve $y = f(x)$ is $2x^2 + 1$. Find $f(x)$ if the graph contains the point $(1, 0)$.

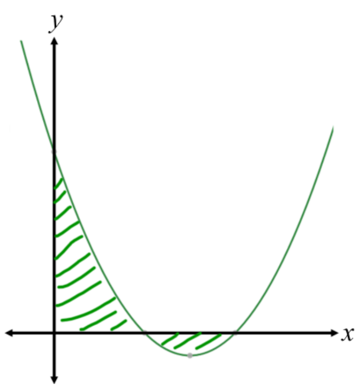
Areas

14.) Find the area enclosed by the graphs of $y = x^2$, $y = 8 - 2x$, and the *x*-axis in quadrant 1.

15.) Find the area enclosed by the graph of $y = \frac{1}{x+1}$, the *y*-axis, and the line $y = 5$.

16.) Find the area between the curves $y = x - 2$ and $y = 4 - x^2$.

17.) The diagram below shows the graph of $y = x^2 - 3x + 2$. Find the area of the shaded region.



18.) The area between the curve $y = ax^2$ and the *x*-axis between -2 and 2 is 20. Find the value of a .

Function Type	Integration Rules (C is the constant of variation)	Notes
1.) Constant	$\int m \cdot dx = mx + c$ where m is a constant	
2.) Constant Multiple	$\int k \cdot f(x) = k \cdot \int f(x)$ where k is a constant	Only works if k is constant.
3.) Power	$\int x^n \cdot dx = \frac{x^{n+1}}{n+1} + c, n \neq -1$	Must ignore $n \neq -1$ to avoid division by zero.
4.) Power of -1	$\int x^{-1} \cdot dx = \int \frac{1}{x} \cdot dx = \ln\|x\| + c$	This rule takes care of the $n \neq -1$ exception for Power.
5.) Sum and Difference	$\int [f(x) \pm g(x)] \cdot dx = \int f(x) \cdot dx \pm \int g(x) \cdot dx$	This rule also applies if there are more than 2 terms.
6.) Exponential	$\int m^x \cdot dx = \frac{m^x}{\ln m} + c$, m is a constant	General rule for exponential.
7.) e^x	$\int e^x \cdot dx = e^x + c$	Specific instance of Exponential where $\ln e = 1$.
8.) Trig	$\int \sin x \cdot dx = -\cos x + c$	
	$\int \cos x \cdot dx = \sin x + c$	
	$\int \tan x \cdot dx = \ln\|\sec x\| + c$	We can derive this later in the course.

Formulas and Identities

Tangent and Cotangent Identities

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Reciprocal Identities

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sin\theta = \frac{1}{\csc\theta}$$

$$\sec\theta = \frac{1}{\cos\theta} \qquad \cos\theta = \frac{1}{\sec\theta}$$

$$\cot\theta = \frac{1}{\tan\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

Sum and Difference Formulas

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$$

$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$

$$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$$

Double Angle Formulas

$$\sin(2\theta) = 2\sin\theta\cos\theta$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

$$= 2\cos^2\theta - 1$$

$$= 1 - 2\sin^2\theta$$

$$\tan(2\theta) = \frac{2\tan\theta}{1 - \tan^2\theta}$$